causes may generally be traced gaps in reefs, and waste places of limited extent in those seas which especially abound in corals. Dana has recognized the effect of warm and cold currents in the general distribution of corals throughout the warmer seas; and the fact of the same influences being at work, and easily recognized, in the waters surrounding the British Islands appears sufficiently interesting to justify me in bringing the subject before this Society.

MISCELLANEOUS.

Pliocene Fossil Fauna of the Niobrara River, in Nebraska.

By Joseph Leidy, M.D.

The researches of Dr. Leidy upon the Lower Miocene Fauna of the *Mauvaises Terres* are well known through his important memoir on the "Ancient Fauna of Nebraska," published in vol. vi. of the 'Smithsonian Contributions.' But the results of the geological survey, by Dr. F. V. Hayden, of the Pliocene deposits along the Valley of the Niobrara are less generally known. We have hitherto deferred noticing them, in the expectation that a detailed memoir, with illustrations, would have appeared on the subject by Dr. Leidy, as in the case of the Nebraska fauna above referred to; but as that has not yet taken place, a brief account of the results may be of interest.

The following is a list of the fossil Mammalia discovered in the Pliocene beds of the Nebraska, as determined by Dr. Leidy:—

Ruminantia.

Merycodus necatus, *Leid.*
Megalomeryx niobrahensis, *Leid.*
Procamelus occidentalis, *Leid.*
—— gracilis, *Leid.*
—— robustus, *Leid.*
Merychyus elegans, *Leid.*
—— medius, *Leid.*
—— major, *Leid.*
Cervus Warreni, *Leid.*

Multungula.

Rhinoceros crassus, *Leid.*
Mastodon (Tetraloph.) mirificus, *Leid.*
Elephas (Eueleph.) imperator, *Leid.*

Solidungula.

Hipparion (Hippotherium) occidentale, *Leid.*
Hipparion (Hippotherium) speciosum, *Leid.*
Merychippus insignis, *Leid.*
—— mirabilis, *Leid.*
Equus excelsus, *Leid.*
—— (Protohippus) perditus, *Leid.*

Rodentia.

Hystrix (Hystricops) venustus, *Leid.*
Castor (Eucastor) tostus, *Leid.*

Carnivora.

Leptarctus primus, *Leid.*
Felis (Pseudælurus) intrepidus, *Leid.*
Ælurodon ferox, *Leid.*
Canis sævus, *Leid.*
—— temerarius, *Leid.*
—— vafer, *Leid.*
—— epicyon, *Leid.*

The first point of general interest in the above list is the entire absence of Edentate forms in the Niobrara fauna. The same observation applies to the Miocene fauna of the "*Mauvaises Terres*," while *Megatherium*, *Megalonyx*, and *Mylodon* occur extensively in the United States; and the leading characteristic of the fossil fauna

of the Pampean deposits of South America is the abundance and variety of the Edentata.

The next most remarkable feature in the Niobrara fauna is its marvellous richness in *Solidungula*, both genera and species. Making allowance for *doubles emplois*, consequent upon the imperfection of the materials, there will still remain a very large number of Equine forms. The valley of the Missouri River, near the Rocky Mountains, appears to have been the head-quarters of the Horses, during the Pliocene period, very much after the manner in which India was the head-quarters of the Proboscidea during the Miocene period. According to Dr. Leidy's determinations, it supported not less than four generic or subgeneric types of *Equus*, namely, *Hipparion*, 2 sp.; *Merychippus*, 2 sp.; *Protohippus*, 1 sp.; *Equus*, 1 sp.; and it is further to be borne in mind that the subjacent Upper Miocene deposits of the same region have yielded two *Anchitheroid* forms,—*A.* (*Hypohippus*) *affinis* and *A.* (*Parahippus*) *cognatus*; while the Lower Miocenes of the "*Mauvaises Terres*" contain *Anchitherium Bairdi*, Leid. The post-Pliocene deposits of the littoral and central States S. E. of the Mississippi have, in addition, furnished fossil remnants which Dr. Leidy refers to *Hipparion venustum*, Leid., *Equus complicatus*, Leid., and *E. fraternus*, Leid., the last two representing the post-Pliocene fossil species of Europe. The whole make up a series of twelve North-American species, Anchitheroid Hippotherian, and Equine proper.

One statement is so unexpected that we quote it in the words of the author. Dr. Leidy observed that, "among all the Mammalian remains brought by Dr. Hayden from the Niobrara River, none were more remarkable than those which he now exhibited. They belong to an Equine animal which has the temporary teeth of *Anchitherium* and the permanent teeth of *Equus*. In both these genera the permanent and deciduous teeth are alike; but the new genus in early life is an *Anchitherium*, and later in life *a true Horse*." The form in question appears to be *Merychippus mirabilis*, Leid.

The results yielded by the Niobrara fossil Pachydermata are equally unexpected. *Rhinoceros crassus*, Leid., is described as a species "which appears to have had almost the same size and formula of dentition as the recent Indian Rhinoceros." In *Mastodon mirificus*, belonging to the group *Tetralophodon*, "the form of the jaw is like that of the existing Elephant of India; a single tooth, the last molar, occupies each side of it, and resembles the corresponding one of *M. angustidens* of Europe or of *M. Sivalensis* of the Sivalik Hills of India." *Elephas imperator*, Leid., was a colossal species, characterized by molars nearly five inches broad, with unusually thick plates, there being only eight bands of wear within a space of seven inches,—a character which at once distinguishes this species from the Mammoth of the United States, *Elephas Americanus* of Leidy.

Dr. Leidy's determinations will probably undergo considerable modification before their final adoption by palæontologists; but the single fact of an American Rhinoceros, in Pliocene deposits, approach-

ing the characters of the existing Indian species is of weighty import in the geographical distribution of Mammalia.

Dr. Leidy, in his general remarks upon the characteristics of the Niobrara fauna, observes that "One of the most remarkable circumstances, in relation with this extinct fauna, is that it is more nearly allied to the present recent one of the old world than to that of our own continent. From a comparison of our recent fauna and flora with that of the eastern continent, the deduction has been made, that the western continent is the older of the two, geologically speaking; whereas the Niobrara fauna would indicate just the reverse relationship of age. A number of similar instances show that totally different faunæ and floræ may be cotemporaneous, and do not necessarily indicate different periods of existence."

Dr. Leidy's enumeration and brief description of the genera and species (*op. cit.* pp. 20–29) is not in exact accordance with the tabular list given by Dr. Hayden, indicating their stratigraphical position (*op. cit.* p. 157). The Ruminant forms *Procamelus robustus* and *P. gracilis*, and the carnivorous *Leptarctus primus*, included by the latter, are omitted by the former. The list given above is founded on Dr. Hayden's enumeration, as being the later in date of publication, and probably embracing additional materials.—*Proc. Acad. Nat. Science of Philadelphia*, 1858.

On a remarkable Form of Rotation in the Pith-cells of Saururus cernuus. By George C. Schaeffer, M.D.

While examining the intimate structure of various plants, I discovered, in the year 1854, a peculiar motion in some of the pith-cells of *Saururus cernuus*, which was so different from anything before described that it seemed to be quite abnormal. Continued observation for eight years has shown however that, for this plant at least, the phenomenon is constant, while an equally long-continued examination of the writers on such subjects has proved that no record of this appearance has ever been made. As a mere microscopical curiosity the fact might be deemed worthy of notice; but the remarkable similarity to a motion which has been considered as invariably connected with a distinct and peculiar vegetable function seems to render its record needful for the true advancement of vegetable physiology.

The *Saururus cernuus*, like many other aquatic or marsh plants, has a pith the cells of which are not in complete juxtaposition, but separated in part by vertical air-passages which are as regularly built around by the cells as a chimney is by its bricks, with this difference, however, that the cells are arranged directly one above another, and do not "break joint" as the bricks would in any properly constructed chimney: no fault in Nature's workmanship, we should remark, since the pith is a mere filling in, surrounded by a much denser and more solidly built structure.

The cells in which the above-mentioned motion occurs are not those from which the party-walls of each air-passage diverge, but